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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/602,600	06/25/2003	Katsushi Ikeuchi	239510US2	1466

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EXAMINER	
PRENDERGAST, ROBERTA D	

ART UNIT	PAPER NUMBER
2671	

DATE MAILED: 07/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/602,600	IKEUCHI ET AL.	
	Examiner	Art Unit	
	Roberta Prendergast	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 June 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11/3/2003*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to because of numerous errors such as reference numbers missing from both the specification and drawing sheets and different reference numbers for the same element, i.e. Fig. 1 element 10 is missing from drawing and Fig. 2 elements S3 and S7 are missing from the specification, etc. The drawings are further objected to because Figs. 5 (A-C), 8 (A-D), 9 (A-E), and 10 (A-D) are unintelligible and Fig. 9D does not disclose colors of microfacets that correspond to numbers of the selected cameras found on page 23 of the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the applicant will be notified and informed of

any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claims 14-19 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Referring to claims 14-19, a computer program product configured to store program instructions for generating an image from a predetermined view direction in association with an object to be rendered using a plurality of first images obtained by photographing the object to be rendered from a plurality of different directions, and second images that pertains to geometry information of the object to be rendered, on a computer system capable of performing the method of claims 8-13, is not claimed as embodied in a computer readable media. Data structures not claimed as embodied in computer-readable material are descriptive material *per se* and are not statutory because they are not capable of causing functional change in the computer. Such claimed data structures do not define any structural and functional interrelationships between the data structure and other claimed aspects of the invention, which permit the data structure's functionality to be realized.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5, 8, 9, 12, 14, 15, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626.

Referring to claim 8, Suzuki et al. teaches an image processing method for generating an image from a predetermined view direction association with an object to be rendered, comprising: generating a plurality of first images obtained by photographing the object be rendered from a plurality of different directions (Figs. 1-4; column 1, lines 40-49; column 2, lines 30-37; column 7, lines 26-37 and 50-65; column 9, lines 58-66), and second images that pertains to geometry information of the object to be rendered (Figs. 1-4; column 1, lines 40-49; column 2, lines 37-45); generating a geometrical shape model of the object to be rendered on the basis of the second images (Figs. 1-4; column 1, lines 40-49; columns 2-3, lines 65-3; column 4, lines 15-20; columns 7-8, lines 65-8; column 8, lines 20-50; column 9, lines 32-45; columns 9-10, lines 58-10; column 10, lines 40-57); generating a plurality of microfacets used to approximate a shape of the geometrical shape model (column 3, lines 1-5, i.e. it is understood that microfacets are polygons) and generating a third image by selecting texture images from the plurality of first images on the basis of the plurality of photographing directions and view direction, and projecting the selected texture images

onto the microfacets (column 3, lines 42-52); but does not specifically teach executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction.

Beasley teaches executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction (column 5, lines 60-67; column 6, lines 62-65; column 7, lines 27-41, i.e. the silhouette images are understood to be projected texture images).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 8 to include executing a billboarding process that rotates the plurality of microfacets to make a predetermined angle with a view direction thereby reducing the amount of processing time required to model complex objects such as trees, which are commonly displayed by the use of billboards as they are difficult to model in 3D and to further allow the object to rotate in synch with the user's viewpoint so that it's almost constantly facing the user (Beasley; column 2, lines 15-24).

Referring to claim 1, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified by Beasley above, teaches an image processing apparatus comprising a memory (Figs. 1(elements 118-120 and 126), 2(elements 208-210 and 220), 3(elements 308-310 and 320), and 4(elements 408-410 and 420); column 7, lines 26-37), a geometrical shape model generation unit (Figs. 1(element 130), 2(element 224), 3(element 324), and 4(element 424); column 7, lines 26-37), a microfacet generation unit (Figs. 1(element 130), 2(element 224), 3(element 324), and 4(element 424); column

3, lines 1-5), and a texture mapping unit (Figs. 1(elements 118-120 and 126), 2(elements 208-210 and 220), 3(elements 308-310 and 320), and 4(elements 408-410 and 420); column 7, lines 26-37) configured to perform the method of claim 8 but does not specifically teach a billboarding processing unit.

Beasley teaches a billboarding processing unit (Fig. 1(element 111) and column 4, lines 48-65, i.e. it is understood that the geometry subsystem portion of a graphics subsystem comprised of a geometry subsystem, a scan conversion subsystem, a raster subsystem, and display subsystem comprises the billboarding processing unit).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the image processing apparatus to include a graphics subsystem containing a billboarding processing unit capable of rotating the plurality of microfacets to make a predetermined angle with a view direction thereby reducing the amount of processing time required to model complex objects such as trees, which are commonly displayed by the use of billboards as they are difficult to model in 3D and to further allow the object to rotate in synch with the user's viewpoint so that it's almost constantly facing the user (Beasley; column 2, lines 15-24).

Referring to claim 14, the rationale for claims 1 and 8 are incorporated herein, Suzu8ki et al., as modified by Beasley above, teaches a computer program product configured to store program instructions for performing the method of claim 8 (Beasley; column 4, lines 18-35 and 48-65). It is inherent that a computer system capable of performing the method of claim 8 is comprised of a computer program product

configured to store program instructions for executing the method as described in claim 8.

Referring to claim 9, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 8, wherein the geometrical shape model is a voxel model formed of a plurality of voxels (Figs. 1-4; column 1, lines 40-49; columns 2-3, lines 65-3; column 4, lines 15-20; columns 7-8, lines 65-8; column 8, lines 20-50; column 9, lines 32-45; columns 9-10, lines 58-10; column 10, lines 40-57), and the microfacets are generated for respective voxels (column 3, lines 1-5, i.e. it is understood that microfacets are polygons).

Referring to claim 2, it recites the elements in claims 1 and 9 and therefore the same rejections apply.

Referring to claim 15, it recites the elements in claims 14 and 9 and therefore the same rejections apply.

Referring to claim 12, the rationale for claim 8 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 8, further comprising selecting at least two first images in ascending order of angle that the view direction and the plurality of photographing directions make, and generating an interpolated image on the basis of the at least two first images, and wherein in texture mapping, the texture images are selected for respective microfacets from the plurality of first images or the interpolated image on the basis of the plurality of photographing directions and view direction, and the selected texture images are projected onto the microfacets (Suzuki et

al.; column 1, lines 45-49; column 6, lines 40-46; column 7, lines 50-59; columns 8-9, lines 65-10).

Referring to claim 5, the rationale for claims 1 and 12 are incorporated herein, Suzuki et al., as modified by Beasley above, recites the elements in claims 1 and 12 and further teaches an interpolated image generation unit (Beasley: Fig. 1(element 111) and column 4, lines 48-65, i.e. it is understood that the geometry subsystem of a graphics subsystem comprised of a geometry subsystem, a scan conversion subsystem, a raster subsystem, and display subsystem is further comprised of a interpolated image generation unit) and therefore the same rejections apply.

Referring to claim 18, it recites the elements in claims 14 and 12 and therefore the same rejections apply.

Claims 13, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626 as applied to claims 5, 12, and 18 above, and further in view of Neugebauer, P.J., "Geometrical cloning of 3D objects via simultaneous registration of multiple range images", Shape Modeling and Applications, 1997. Proceedings, 1997 International Conference on 3-6 March 1997 Page(s)130 - 139.

Referring to claim 13, the rationale for claim 12 is incorporated herein, Suzuki et al., as modified by Beasley above, teaches a method according to claim 12 further comprising appending geometry information each pixel of the plurality of first images and the interpolated image on the basis of the second images (column 8,lines 40-50; column 9,lines 33-44; columns 9-10, lines 64-9, i.e. it is understood that voxel

calculation entails appending geometry information, i.e. depth information from the second images, to each pixel) but does not specifically teach executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel.

Neugebauer teaches executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel (page 135, section 7 Visibility criterion, 1st and 2nd paragraphs; page 137, section 8.3. Direct rendering; Fig. 9).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 9 to include executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and the interpolated image, and a distance from a viewpoint to each voxel thereby eliminating self-occlusion errors and making it possible to reconstruct concave and convex objects, and even objects with holes out of an arbitrary number of range images (page 130, Introduction, 3rd paragraph).

Referring to claim 19, it recites the elements in claims 14 and 18 and therefore the same rejections apply.

Claims 3, 10, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626

as applied to claims 1-2, 8-9, and 14-15 above, and further in view of Ogata et al. U.S. Patent No. 6313841.

Referring to claim 10, the rationale for claim 9 is incorporated herein, Suzuki et al., as modified by Beasley above, teaches a method according to claim 9, but does not specifically teach wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images.

Ogata et al. teaches wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images (Fig. 16; column 3, lines 10-28; column 10, lines 16-24; column 11, lines 1-19).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 9 to include wherein the step of generating the geometrical shape mode includes the step of controlling the number of voxels be generated on the basis of precision of the second images thereby reducing the expensive computing costs due to processing large numbers of voxels (column 1, lines 18-27).

Referring to claim 3, it recites the elements in claims 1 and 9 and therefore the same rejections apply.

Referring to claim 16, it recites the elements in claims 14 and 9 and therefore the same rejections apply.

Claims 4, 6, 7, 11, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al. U.S. Patent No. 6573912 in view of Beasley U.S. Patent No. 5936626 as applied to claim 9 above, and further in view of Gannett U.S. Patent No. 6118452.

Referring to claim 11, the rationale for claim 9 is incorporated herein, Suzuki et al., as modified above, teaches a method according to claim 9, further comprising appending geometry information to each pixel of the plurality of first images on the basis of the second images (column 9,lines 33-44; columns 9-10, lines 64-9, i.e. it is understood that voxel calculation entails appending geometry information, i.e. depth information from the second images, to each pixel), but does not specifically teach executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel.

Gannett teaches executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each voxel (column 7, lines 23-46 and 63-67; column 8, lines 34-38; column 9, lines 4-9 and 34-43; column 12, lines 34-51; columns 16-17, lines 55-13).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the method as recited in claim 9 to include executing a clipping process of the plurality of first images on the basis of the geometry information of each pixel of each first image and a distance from a viewpoint to each

voxel thereby providing significant performance enhancements (Gannett: Abstract; columns 9-10, lines 60-13).

Referring to claim 4, Suzuki et al., as modified by Beasley above, recites the elements in claims 1 and 9 and further teaches a clipping processing unit (Beasley: Fig. 1(element 111) and column 4, lines 48-65, i.e. it is understood that the raster subsystem of a graphics subsystem comprised of a geometry subsystem, a scan conversion subsystem, a raster subsystem, and display subsystem is further comprised of a clipping processing unit) and therefore the same rejections apply.

Referring to claim 17, it recites the elements in claims 14 and 9 and therefore the same rejections apply.

Referring to claim 6, it recites the elements in claims 1, 4 and 5 and therefore the same rejections apply.

Referring to claim 7, the rationale for claim 4 is incorporated herein, Suzuki et al., as modified above, teaches an apparatus according to claim 4 wherein the clipping process unit comprises graphics hardware, see rationale for claim 4 and therefore the same rejections apply.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents and are cited to further show the state of the art with respect to view-dependent texture mapping and clipping.

Stewart et al. U. S. Patent No. 5898438

Sprague U. S. Patent No. 6018348

Lichtenbelt et al. U. S. Patent No. 6072497

Georgiev U. S. Patent No. 6268846

Suits et al. U. S. Patent No. 6525731

Matusik et al. U. S. Patent Application No. 2003/0231173

Efran et al. U. S. Patent Application No. 2003/0137506

The following patents and are cited to further show the state of the art with respect to Billboarding.

McDowall et al. U. S. Patent No. 5905499

Lection et al. U. S. Patent No. 6052123

Barcena et al. U. S. Patent No. 6163320

Latham U. S. Patent No. 6184857

McDowall et al. U. S. Patent No. 6285370

Barcena et al. U. S. Patent No. 6445395

The following Non-Patent Literature is cited to further show the state of the art with respect to view-dependent texture mapping.

Lifeng Wang; Sing Bing Kang; Szeliski, R.; Heung-Yeung Shum; "Optimal texture map reconstruction from multiple views", Computer Vision and Pattern Recognition, 2001. CVPR 2001. Proceedings of the 2001 IEEE Computer Society Conference on Volume 1, 2001 Page(s):I-347 - I-354 vol.1

Debevec, P.E.; Taylor, C.J.; Malik, J.; Levin, G.; Borshukov, G.; Yu, Y.; "Image-based modeling and rendering of architecture with interactive photogrammetry and view-dependent texture mapping", Circuits and Systems, 1998. ISCAS '98. Proceedings of the 1998 IEEE International Symposium on Volume 5, 31 May-3 June 1998 Page(s):514 - 517 vol.5

Raskar, R.; Kok-Lim Low; "Blending multiple views", Computer Graphics and Applications, 2002. Proceedings. 10th Pacific Conference on 9-11 Oct. 2002 Page(s)145 - 153

Rademacher, P. 1999. "View-dependent geometry". In *Proceedings of the 26th Annual Conference on Computer Graphics and interactive Techniques* International Conference on Computer Graphics and Interactive Techniques. ACM Press/Addison-Wesley Publishing Co., New York, NY, 439-446

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberta Prendergast whose telephone number is (571) 272-7647. The examiner can normally be reached on M-F 7:00-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

RP

ULKA J. CHAUHAN
PRIMARY EXAMINER